Introduction

The *Guide to Physical Therapist Practice* (American Physical Therapy Association, 2001) suggests that goals of therapy should focus on treatment of impairments (e.g., strength, endurance, or range of motion, etc….), but anticipated outcomes of intervention should include minimization of functional and activity limitations, optimization of health status, prevention of disability in daily life, and consumer satisfaction .

Understanding what is happening to a child when there are concerns that the child's health and development are being impaired remains a core professional activity for those working with children and families.

Today is expected to be 'evidence-based.

Developmental terms

Growth: increase and change in the size and composition of the body structure which is physically measurable.

Development: sequential changes and increased complexity of function.

Maturation: the total process in which genetic & environmental influences combine so that the underlying structures & functions of the nervous system become differentially more complex and integrated.

Heredity: determines the limits of each individual child's capacity to achieve optimal structural & functional maturity.

Normal: usual, typical, regular, free of abnormality, typical characteristics for age

Average: calculated point around which other values are dispersed

Prenatal period terminology

Gestation: period of intrauterine development from conception to birth

Embryo: up to eight week of gestation.

Fetus: from eight week of gestation to birth.

Neonatal and postnatal period terminology

Neonate: newborn from birth to end of second week.

Infancy: first two years of life.

Premature: viable infant less than 38 weeks gestation.

Term infant: viable infant, 38-42 weeks gestation

Childhood period terminology

Toddler: period between two and three years old

Early childhood: second through sixth year

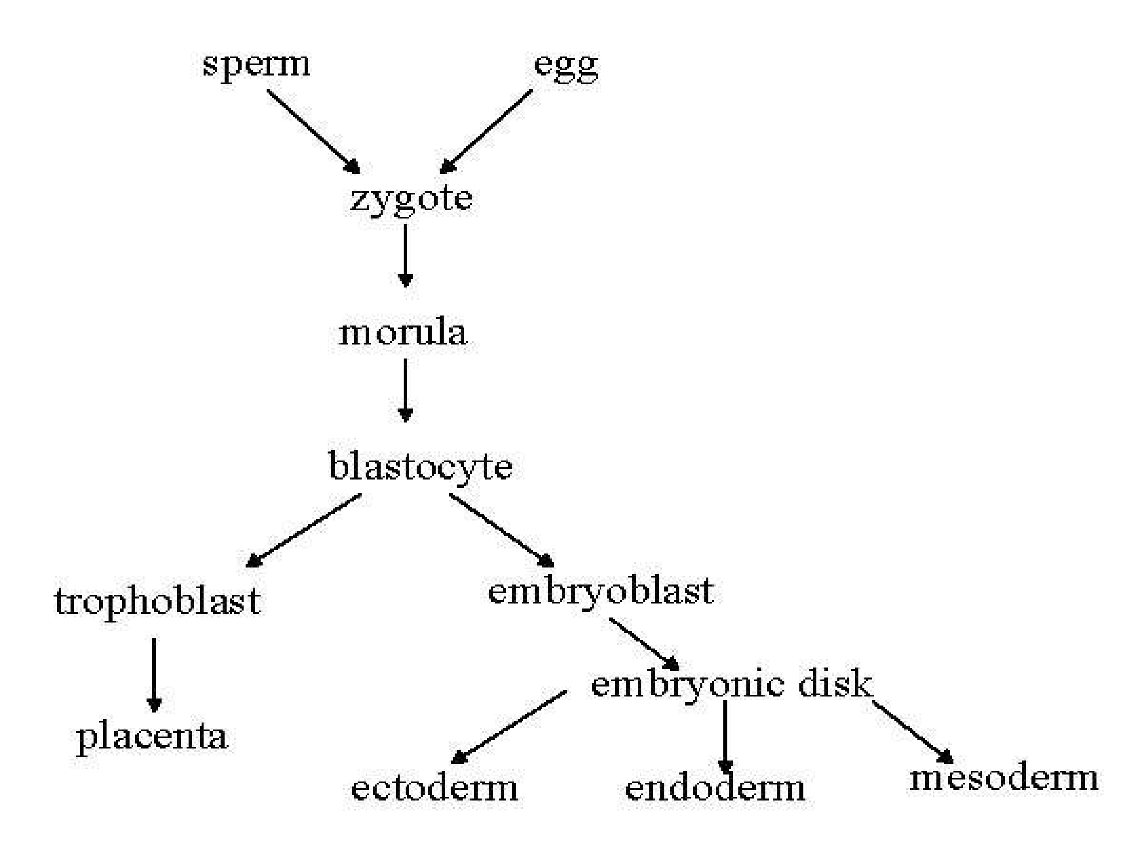
Middle childhood: seventh through ninth year

Late childhood: 10 to 15 years (female) or 16 years (male).

Adolescence period terminology

Teenage years (13 to 18) or commencing with onset of puberty to freedom from parents or to commitment to work.

Fig. 2.1 – Prenatal Development (Worksheet 2.1)



Fetal Development

First Trimester of Pregnancy

A sperm fertilizes an ovium . The bundle of cells then implants itself into the wall of the uterus, where it will continue to develop and grow. At three weeks, the bundle of cells and the tiny heart begins to beat. By the end of the fourth week, we can now easily make out the head, which has a rudimentary brain inside, as well as the buds that will become arms and legs. At the beginning of the second month, signs of the eyes, nose and ears. The embryo can move it's head, body and limbs slowly . The embryo's communication with the external world has begun. Respond to tactile stimulation as her coordination improves. Development between the third and eighth weeks is highly important since the outlines of all internal and external structures are developed. The third month, the heart is beating much stronger. The face is broad, the eyes quite separated, and now experience smell. Although is already moving, movements are still imperceptible to the mother.

Second Trimester of Pregnancy

The head is developing more actively than the rest of the body; the eyes, mouth, nose, and ears are almost completely formed, creating a well-defined face.
The eyes are already sensible to light and acquired new abilities, like the capacity to react to music and to loud noises. By the fifth month, the fetus exercises these senses of touch and movement. Moves the arms and legs strongly enough to be perceived by mom. The fingers have become more agile and move freely.
The abilities sharpen developing coordination and strength. After the fifth month, something extraordinary occurs, actually begin to hear! hears the sounds coming from the body, your voice and the voices of other people who are speaking closely. Hear environmental sounds. Rhythmic music calms her and strident sounds excite her. Can hear and learn. Memory and the ability to react to stimuli are already present .

Third Trimester of Pregnancy

By the 7th month, the nervous system has matured to the point that it now controls respiratory functions and body temperature. The lungs would be capable of breathing if she was born at this point. The movements are more organized, and muscles stronger. Not only does move to the rhythm of music, but also prefers some types of music to others. In the eighth month, the nervous system is fully formed and ready to operate through a complex mass of neurons. The signals they emit turn into messages, ideas, decisions and memory. During the 9th month, continue growing and developing until birth. Many internal physiological transformations are occurring, preparing transition to the world outside the womb.

☞ While newborns do not smile until 4-6 weeks after birth, babies in the uterus do. Maybe because the uterus is warm, comfortable, and shielded from loud noise and bright light.

☞At eight weeks gestation, this fetus is able to kick and straighten his legs, turn them round and move his arms up and down .

☞At ten weeks gestation, this fetus can move her arms and legs with a range of movements that are fluid and supple .

☞ Fetuses as young as 11 weeks have been seen with their thumbs in their mouths. This baby started out sucking his smallest toes and gradually moves on to suck a bigger and better toe.

☞At 22 weeks gestation babies are capable of fine hand and finger movements. In a short space of time this baby scratches, rubs and pats his cheek before doing the same to his nose.

☞ This baby's brain has developed sufficiently to enable him apparently to sense the other parts of his body. He can bring his fingertips together so they touch.

☞ From about 24 weeks of pregnancy when retinal development is complete, babies open and close their eyes intermittently. This helps a baby to perfect the blinking reflex, which will protect his eyes once he's born .

☞ Although grasping begins early it becomes better established during the last trimester. Babies grasp hands, feet, fingers, toes and, most commonly, their umbilical cords.

PHASES OF MOTOR BEHAVIOR

Phase	Approximate age	Stage
Reflexive/ spontaneous rudimentary	conception birth	prenatal
	6 mo.	infancy
Fundamental Movement	2 years	early childhood
Sport skill	6	later childhood
Growth & Refinement	12	Adolescence
	18	
Peak performance	30	adulthood
Regression	70	older adulthood

Not all parts of the body grow at the same rate. The 4 Major Principles Governing Growth :

1) The **CEPHALOCAUDAL PRINCIPLE** states that growth follows a pattern that begins with the head and upper body parts and then proceeds to the rest of the body.

2) The **PROXIMODISTAL PRINCIPLE** states that development proceeds from the center of the body outward.

3) The **PRINCIPLE OF HIERARCHICAL INTEGRATION** states that simple skills typically develop separately and independently but are later integrated into more complex skills (integration)

4) The **PRINCIPLE OF INDEPENDENCE OF SYSTEMS** suggests that different body systems grow at different rates differentiation - mass to specific action) .

What seems to play a major role, then, in the general observation of cephalocaudal progression of development are the infant's strength of key muscle groups and anthropometric characteristics, that is, the ability to control the large mass of the head relative to the rest of the body and cope with the high center of mass.

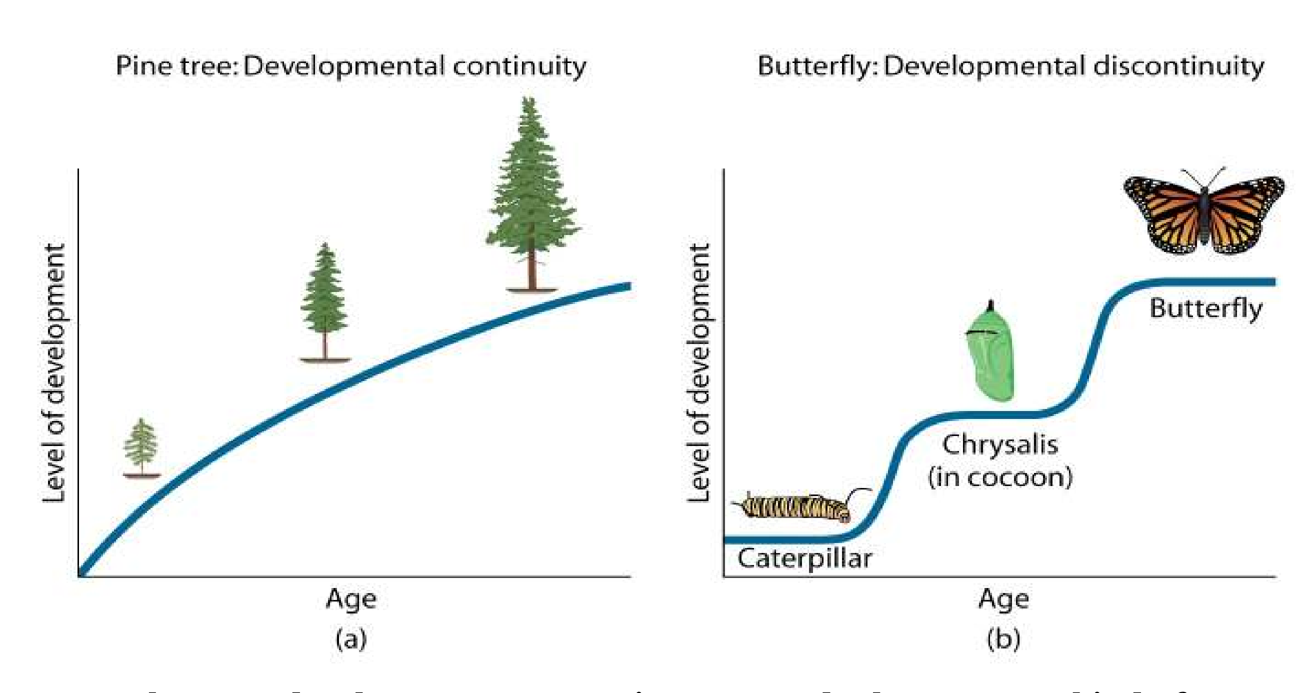
Sensitive Periods in Development

✐ They stressed that experience-dependent plasticity of the nervous system can initiate the generation of new synaptic connections and is available throughout the life span.

✐ The theory also predicts that sensitive periods in experience-expectant development can be extended by various means, including deprivation of sensory inputs that allow synaptic competition for connections to persist longer than is usual.

✐ They stressed that experience-dependent plasticity of the nervous system can initiate the generation of new synaptic connections and is available throughout the life span. The effects of experiences during a sensitive period, however, are expected to be qualitatively different from those at other points in the life span

Continuous and discontinuous development



Some researchers see development as a continuous, gradual process, as kind of a tree growing taller with each passing year. Others see it as a Discontinuous process, involving sudden dramatic changes, such as the transition from caterpillar to cocoon to butterfly. Both views fit some aspects of child development.

Individual Variation and Normative Development

Developmental change is a basic fact of human.

Existence and each person is developmentally unique.

Infants develop similarly in many ways.

They also develop differently in many ways.

Physical Growth

Average birth weights

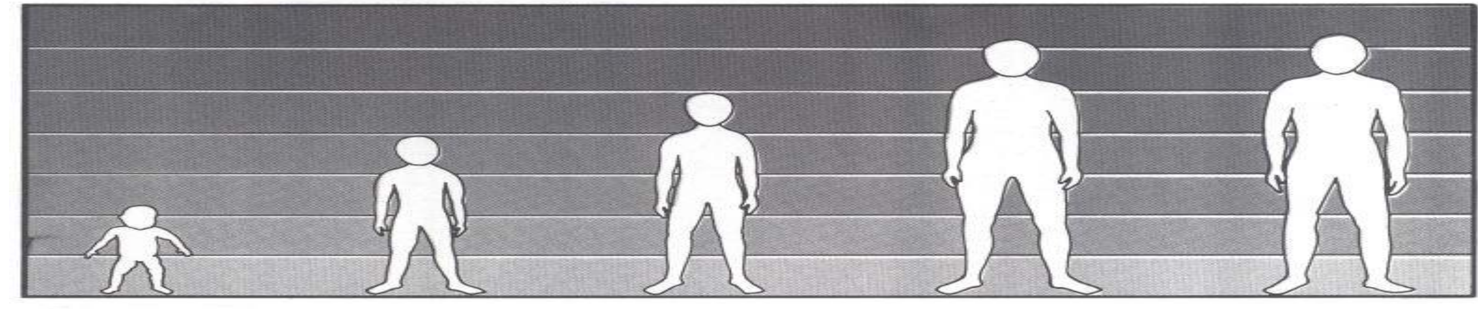
(progression through the 1st 2 years)

Growth milestones are the most predicable, although they must be viewed within the context of each child's specific genetic and ethnic influences.

✎ By age 5 months, the average infant's birth weight has *doubled* to about 15 pounds.

✎ By age 1, the infants' birth weight has *tripled* to approximately 22 pounds.

✎ By the end of its second year, the average child weighs *four times* its birth weight.



The increase in body size from birth to adult

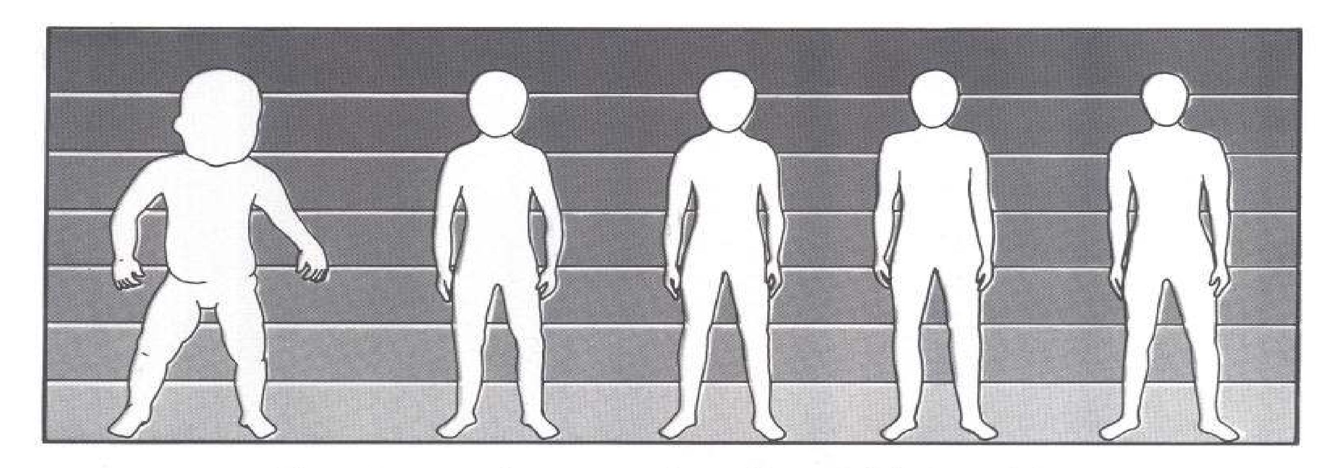
Children grow in size at a very fast rate.

At birth infants are only about a quarter of their adult height. This final adult height is usually reached at about twenty years of age.

Stages of growth from birth to adult:

- **Rapid growth in infancy and early childhood**
- **Slow, steady growth in middle childhood**
- **Rapid growth during puberty**
- **Gradual slowing down of growth in adolescence until Adult height is reached**

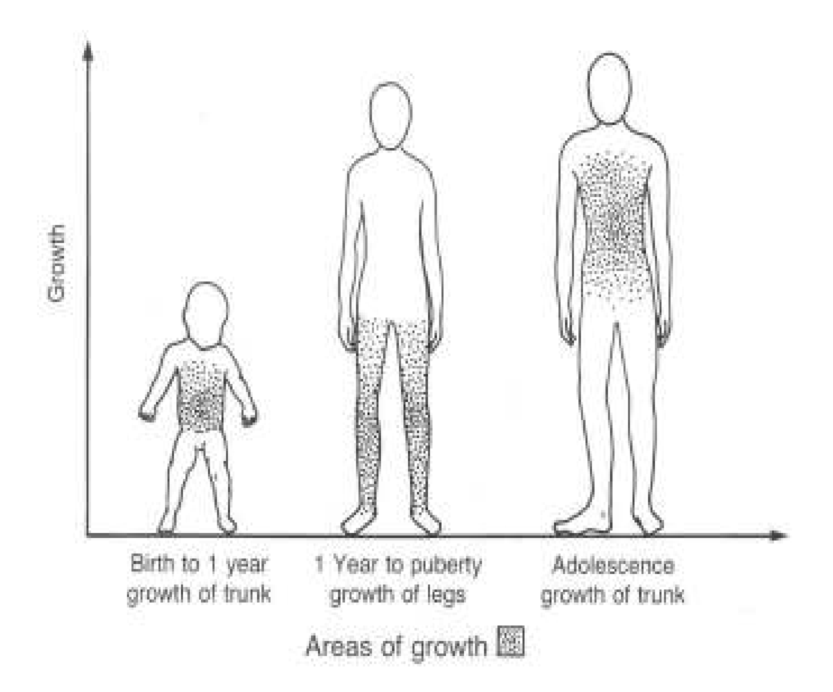
The head is proportionally large and the legs proportionally short during childhood.
At birth the head is one quarter of the length of the body compared with about one sixth in the adult.
The legs are about one third the length of the body at birth and one half in the adult.
Because the body proportions change this means that not all of the body segments grow by the same amount.



The changes in proportions from birth to adult

Area Of Growth

These changes in body proportions will have a great influence on how skills will be performed. Changes in the relative size of the head in childhood affects the balance of the body during movement and the relative shortness of the legs in the very young limits running ability. At the beginning of puberty children have long arms and legs. They are better suited for running but the rapid growth may make them appear to be clumsy and to have difficulty in coordination.



Average Height and length

Neonates and infants

Infants should be placed with the top of the head against the fixed headboard of the measurement device and with the eye-ear plane perpendicular to the base of the device. The child's knees must be flat against the table and the footboard moved until the soles of the feet are against it, with the toes pointing up.

Small inaccuracies in length measurement can easily affect a child's percentiles on growth curve charts.

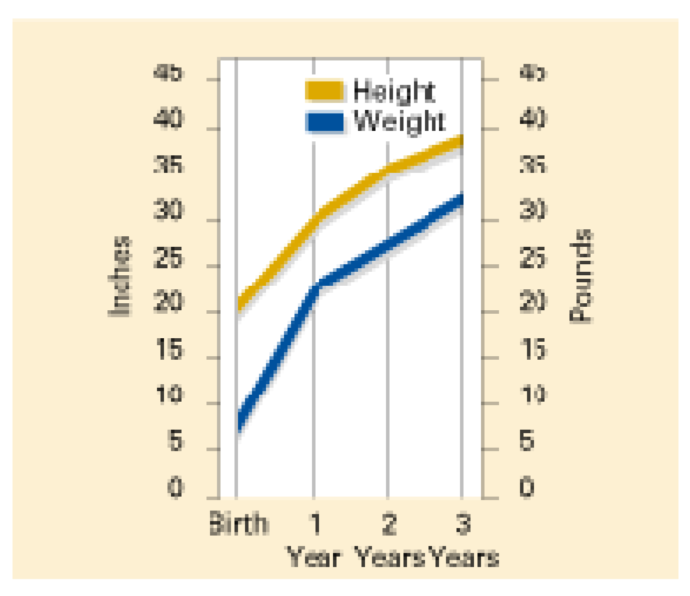
By age 1, the average baby stands 30 inches tall. and by the end of the second year the average child is three feet tall.

Growth in children older than 2 y is measured with the child standing. A diurnal variation of <0.7 cm in height may occur in these children, Children should be measured without shoes while standing against the vertical plane to which the measuring tape is attached. The child's heels, buttocks, shoulders, and back of the head should be touching the wall.

The eye-ear plane should be perpendicular to the wall and the feet, including the heels, should be flat on the floor.

With the child in this position, the right-angle device is lowered until it touches the top of the head, and the height is recorded on the appropriate physical growth curve.

<u>**Height & Weight Growth**</u>



The greatest height & weight increases occur during the 1st year of life, but children continue to grow through infancy & toddlerhood.

Infant

Is derived from the Latin word, "*infans*," meaning "unable to speak."

The infant is a dynamic, ever-changing being who undergoes an orderly and predictable sequence of neurodevelopmental and physical growth.

This sequence is influenced continuously

by intrinsic and extrinsic forces that produce individual variation and make each infant's developmental path unique.

Importance of Infancy

* To determine which abilities are inborn and which develop with age and experience

* Parents want to know how best to provide a rich and positive environment for their child

* Provides infant with a safe environment in which they can observe and learn about the world around them

* To construct a knowledge base .

* “Neurodevelopmental sequences can be viewed broadly in terms of the traditional developmental milestones.

*Developmental milestones provide a systematic approach by which to observe the progress of the infant over time.

*Attainment of a particular skill builds on the achievement of earlier skills.

*Developmental milestones serve as the basis of most standardized assessment and screening tools.

* Working knowledge of development is the very basis of the practice of pediatric physical therapy. It provides the norms for functioning of children at various ages that guide diagnosis and treatment planning through emphasis on selection of age-appropriate skills as functional outcomes.

General Appearance of Newborns

In most cases, infants seem to be in a state of quiet alertness during the first hour or so after delivery.

<u>During the first weeks.</u>

- The baby will tend to keep his fists clenched.
- Elbows bent, hips and knees flexed, and arms and legs held close to the front of his or her body.
- Infants who are born prematurely may display several differences in their posture, appearance, activity, and behavior compared with full-term newborns.

Posture and large movements

1 MONTH

- Lies back with head to one side; arm and leg on same side outstretched, or both arms flexed; knees apart, soles of feet turned inwards.
- Large jerky movements of limbs, arms more active than legs. At rest, hands closed and thumb turned in. Fingers and toes fan out during extensor movements of limbs.
- When cheek touched, turns to same side; ear gently rubbed, turns head away.
- When lifted or pulled to sit head falls loosely backwards.
- Held sitting, head falls forward, with back in one complete curve.

Posture and large movements

3 MONTH

- Placed downwards on face, head immediately turns to side;
- arms and legs flexed under body, buttocks humped up.
- Held standing on hard surface, presses down feet, straightens body and often makes reflex ‘stepping’
- Now prefers to lie on back with head in mid-line.
- Limbs more pliable, movements smoother and more continuous.
- Waves arms symmetrically. Hands now loosely open.

Posture and large movements

6 MONTH

- Brings hands together from side into mid-line over chest or chin.
- Kicks vigorously, legs alternating or occasionally together.
- Held sitting, holds back straight, except in lumbar region, with head erect and steady for several seconds before bobbing forwards.
- Placed downwards on face lifts head and upper chest well up in mid-line, using forearms as support, and often scratching at table surface; legs straight, buttocks flat.
- Held standing with feet on hard surface, sags at knees.

Gross Motor Development in Infants

A typical infant tends to follow a known developmental progression that starts at birth.

As the infant grows and his central nervous system matures, the gross motor skills develop in a head to foot progression.

The major gross motor milestones of the first 12 to 18 months include achieving an indefinitely maintained **upright head posture**, attaining prone-on-elbows position, **rolling** from supine to prone, independent **sitting**, attaining hands-and-knees position, moving from sitting to four-point position and prone, **creeping** on hands and knees, pulling to a stand, **standing** independently, and **walking** independently

Gross Motor Skills: Head Control

- Head control is the first movement that a baby achieves. It is necessary to attain other movement skills such as sitting, crawling, and walking.
- Head control requires strength and coordination of the muscles which flex (bend) and extend (straighten) the neck.
- Infants are born with a flexion pattern throughout their neck and bodies. The infants will develop extension by repeatedly attempting to lift their head and turn it from side to side.
- A Infant will develop head control in three major positions; prone (on tummy), supine (on back), and in sitting.
- A baby is generally motivated to turn his head in attempt to see an object, or to locate a near by sound.
- When a child has a visual and hearing impairment, there are other ways to encourage head control and exploration.

Functional Head Control

At birth

- Infants already have the capacity to right the head from either full flexion or full extension when they are supported in an upright position.
- A stable vertical head position, however, cannot usually be sustained for more than a second or two, if at all.
- or with the head supported in a reclining position, head-turning to either side of midline can usually be elicited by attracting the infant's visual orientation to a moving object.

At about 2 months

- Given the large weight of the head relative to the rest of the body at this age, a stabilizing postural function of the legs and pelvis must provide a stable base of support for simultaneous neck and trunk extension with arm movement.
- The developmental progression in both supine and prone positions involves a gradual shifting of the load-bearing surfaces in a caudal direction.

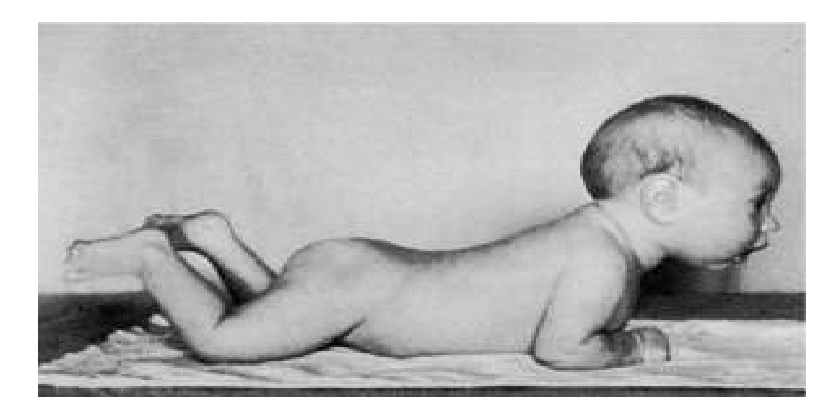
At about 2 months, the infant can sustain the head in midline in the frontal plane during supported sitting but often appears to be looking down at his or her feet, so that the eyes are oriented about 30° below the horizontal plane

In these Figure Early head control in space is characterized by ability to stabilize the head in midline but with eyes angled downward from the vertical.



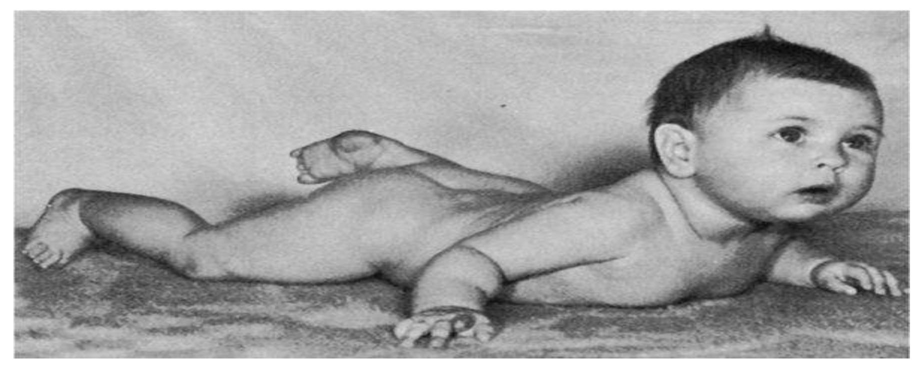
When stabilizing control of the head in the upright position has been attained, the infant can typically organize head and trunk activity so that when placed prone with the arms extended along the sides of the body, the prone-on-elbows position is rapidly assumed by lifting the head and extending the thoracic spine while simultaneously bringing both arms up to rest on the elbows.

In Figure 2 month infant in Early stage of prone-on-elbows posture with stable neck extension, elbows close to trunk, and flexed hips and knees.



By the end of the third or fourth month

- The head, in conjunction with organized trunk and lower extremity extension, has largely perfected the maintenance of stable positioning in space appropriate for the further development of eye-head-hand control and of independent sitting to come .
- Commensurate with acquisition of functional control of head positioning are important developments in control of the arms.
- In these Figure Advanced stage of prone-on-elbows posture, with free movement of head and arms and extended lower extremities



Upright Trunk Control

Gross Motor Skills: Sitting

- Initially a baby sits by propping forward with both hands in front of him.
- As his balance and upright posture improve, he maintains the sitting position by placing a hand to one side or the other as needed to keep himself sitting upright.
- Eventually the baby can hold himself in a good sitting position without the use of his hands for balance.

Upright Trunk Control

- The initial ability to maintain sitting independently on propped arms when placed is achieved after the infant is able to
- (1) extend the head and trunk in prone position so as to use the legs and pelvis as the load-bearing surfaces and
- (2) control the pelvis and lower extremities while using the arms or moving the head in supine position, that is, has developed anticipatory stabilizing responses to counteract internally generated forces caused by movement.

Midway through the first year

- The average child has achieved the ability to sit alone , and can successfully manipulate an object with one hand while the other hand holds it.
- Although sitting and manipulating at once may still be a challenge.
- Early stage of independent sitting, with arms used for balance as in the fellowing Fig.
- **T**he ability to maintain a sitting position requires a baby to have developed equilibrium reactions and protective responses in the forward, backward, and side to side directions
- If a baby has difficulty with maintaining balance, his equilibrium reactions can often be improved by playing with him in the sitting position, and challenging his balance in all directions.



- If a baby has muscle tightness in his legs, or weakness in his neck or trunk muscles, sitting will be more difficult for the baby.

Gross Motor Skills

Rolling

- The ability to roll smoothly from back to stomach, or stomach to back requires some degree of head control, and a rotation movement that occurs along the trunk of the body, between the hips and the shoulders.
- Rolling is the first movement that allows a baby to change his position, and usually develops between four and five months of age

Upright Trunk Control

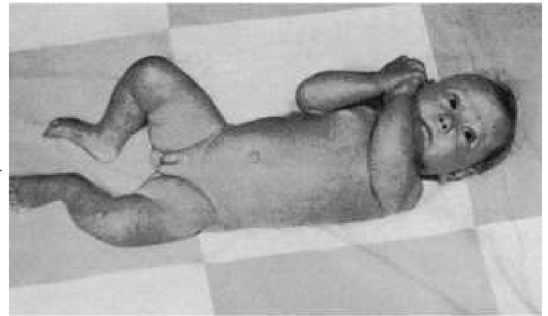
- Functional movements free the child from a spot on which she or he is placed by others.
- Control of lower trunk and pelvis, combined with previously achieved upper body skills, provides new mobility when prone.
- The presence of oscillations also continues to develop new developments. Rocking on four limbs before launching into creeping.





Upright Trunk Control

- The child in sitting lacks the fine pelvic and lower extremity control needed for moving into and out of the position or for turning the trunk freely on a stable base.
- Pelvic control functions begin to be developed at this time, however, in rolling from supine to prone position as in the following , pivoting while prone, and playing with the legs and feet while supine.



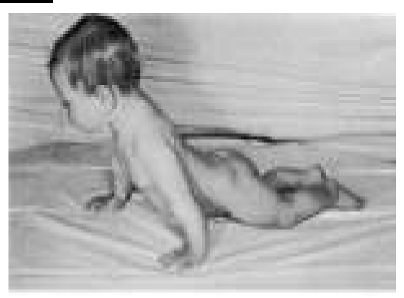




- An infant with visual and auditory impairments can be encouraged to roll by providing him with brightly or your voice introduced from the side.
- If a baby is physically unable to roll, you can help him roll so he can experience this pattern of movement.
- A child who is visually impaired generally prefers being on his back, and will often learn to roll from his stomach to his back to avoid being on his stomach
- An infant with abnormal muscle tone may have difficulty with this movement.
- Spasticity can cause stiffness through the trunk, interfering with a coordinated rolling movement.
- A baby who is weak or floppy may not be able to begin the movement, as rolling requires enough strength to move against gravity.

Lower Trunk Control in the Upright Position

During the third quarter





Functional movements free the child from a spot on which she or he is placed by others. Control of lower trunk and pelvis, combined with previously achieved upper body skills, provides new mobility when prone (Fig. 7), Dynamic play in prone position includes push-ups on extended arms and “flying” with strong trunk extension and scapular retraction.

Lower Trunk Control in the Upright Position

During the third quarter



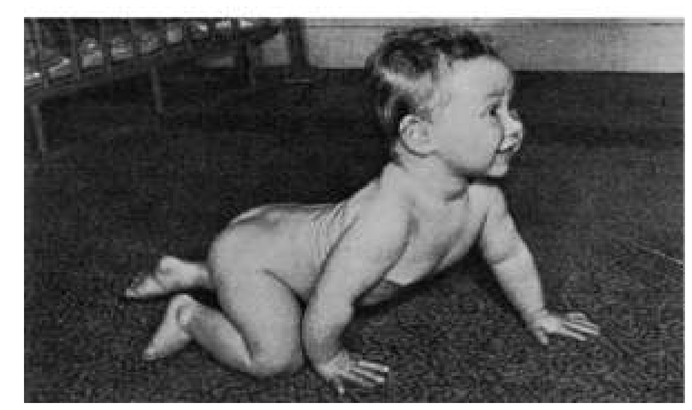


Figure 8 Creeping on hands and knees.

During the third quarter



- Freedom from a strong midline symmetry that previously characterized postural control and the continued refinement of rotational abilities within the axis of the trunk.
- Figure 9 The infant moves from sitting to the four-point position over one leg.

Gross Motor Skills

Pull to stand, Cruising and Walking

- Once an infant develops strength, coordination, and balance to move about freely on the floor, he will begin to pull up to stand and discover ways to explore things that were previously out of his reach .
- As a baby pulls to his feet and stands, he gains further strength and control in his trunk and leg muscles.
- Soon he develops enough strength and balance to "cruise" along furniture, as he sidesteps to reach a new destination.
- This sidestepping teaches the weight shift your baby will need to take steps forward in walking.

Lower Extremity Control in the Upright Position



- Once the child has attained competence at standing and cruising along furniture, the legs and feet move toward perfection of selective control because the trunk and pelvis are increasingly reliable supports that permit freedom of lower extremity activities.
- In creeping, pelvic swiveling motions give way to reciprocal hip flexion and extension activity, and creeping velocity increases because an arm and a leg on the same side of the body can be placed in simultaneous flight.

Fine Lower Extremity Control in the Upright Position



Bear-walk with dorsiflexed ankles, flexed hips, and partially extended knees Figure 11 "Bear-walking" on hands and feet.

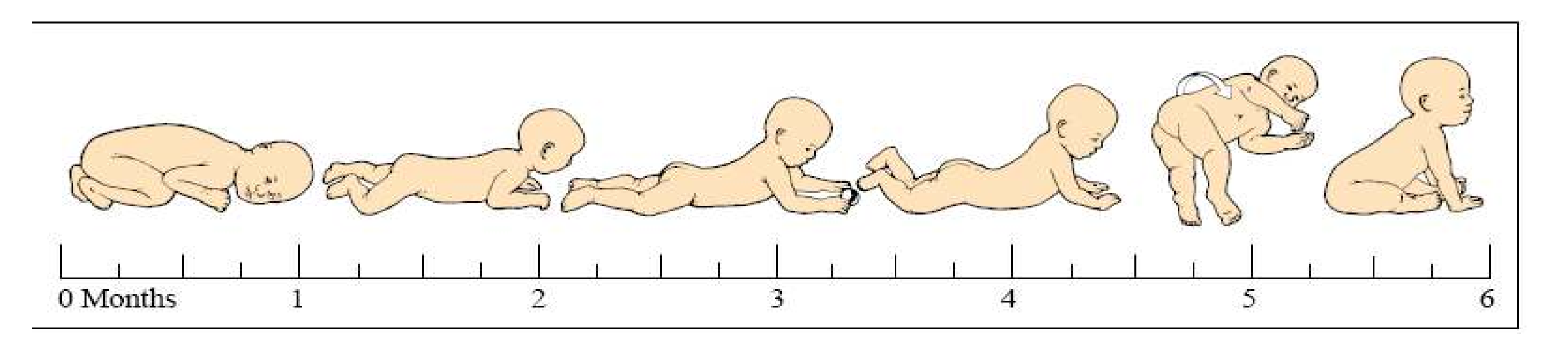


Finally, stand and walk independently at 9 to 15 months of age.

As an example of typical regressions in the course of development, the early stage of walking is accompanied by a return to two-handed reaching which declines again in frequency as balance control improves . Fig. 12 The infant walks and carries a toy, with wide-based gait and hands in "guard" position.





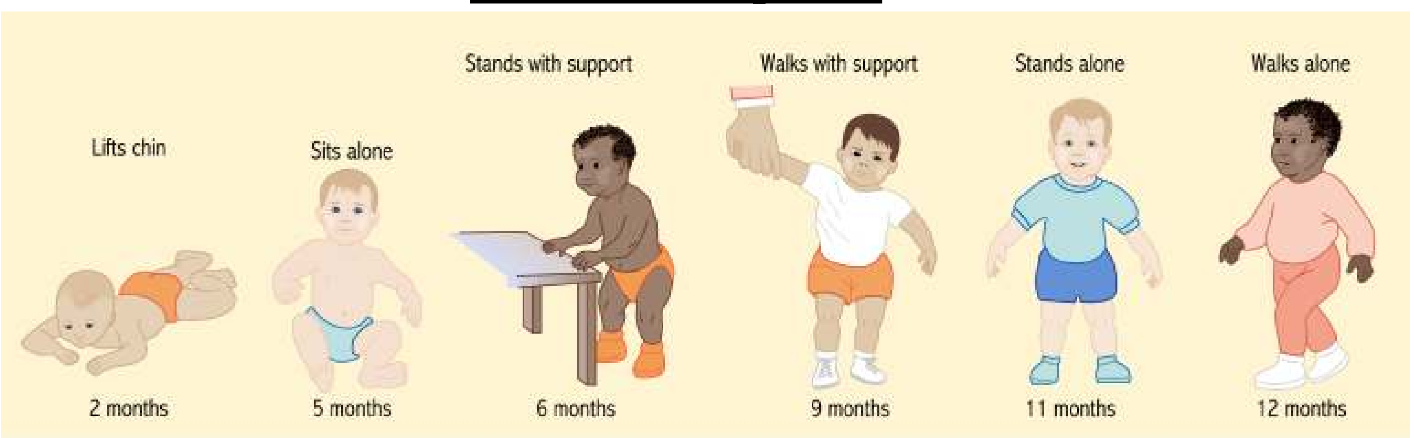


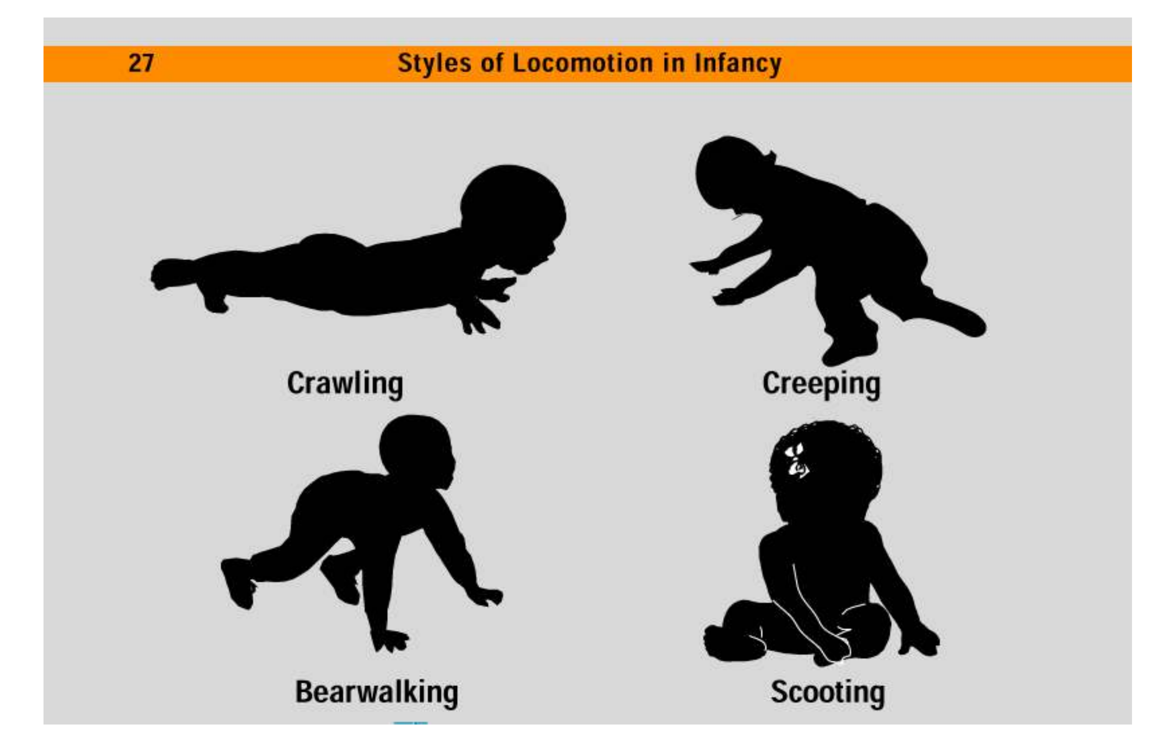
Gross Motor Skills

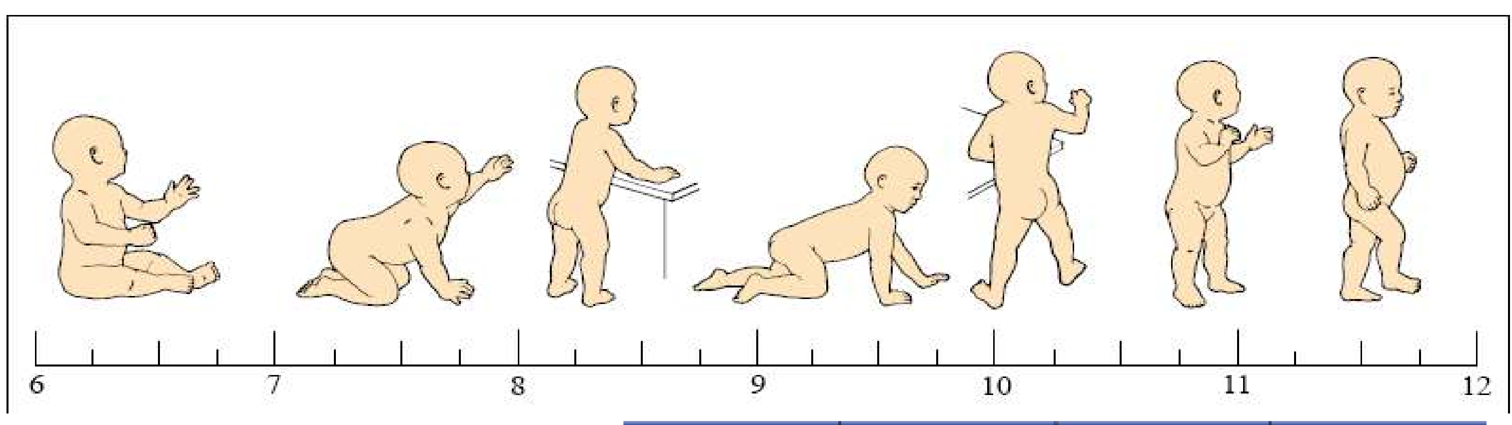
(rolling over, sitting upright, walking)

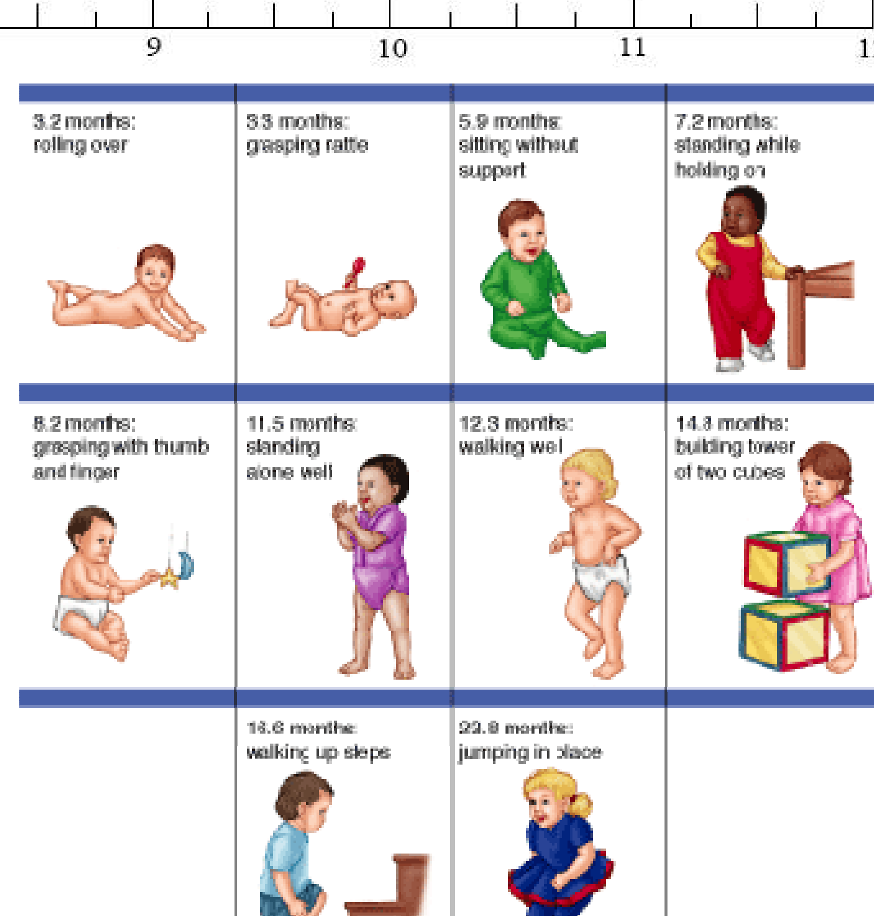
- By 6 months infants can move by themselves.
- Most can sit unsupported by 6 months
- Crawling appears between 8-10 months.
- Infants can walk holding on to furniture by 9 months and most can walk alone by 1 year.

Motor Development









<u>Milestones of Motor Development</u>

<u>50% of children are able to perform each skill at the month indicated, but the specific timing varies widely!</u>

It is important to keep in mind that the time frames presented are averages and some children may achieve various developmental milestones earlier or later than the average but still be within the normal range.

The first five years of life are a time of incredible growth and learning

Developmental quotient

- The developmental quotient (DQ) is the developmental age divided by chronologic age times 100 (see Example below).
- This provides a simple expression of deviation from the norm.
- A quotient above 85 in any domain is considered within normal limits;
- a quotient below 70 is considered abnormal.
- A quotient between 70 and 85 represents a gray area that warrants close follow-up.

Example: Motor Quotient

A 12-month-old boy is seen for health supervision. He is not walking alone, but he pulls up to stand (9 months), cruises around furniture (10 months), and walks fairly well when his mother holds both hands (10 months). This child has a gross motor age of 10 months at a hronologic age of 12 months. Should this 2-month discrepancy be a concern? To decide, one should calculate the DQ by using these gross motor milestones:

$$DQ = \frac{\text{motor age}}{\text{chronologic age}} \times 100 = \frac{\text{10 months}}{\text{12 months}} = 83$$

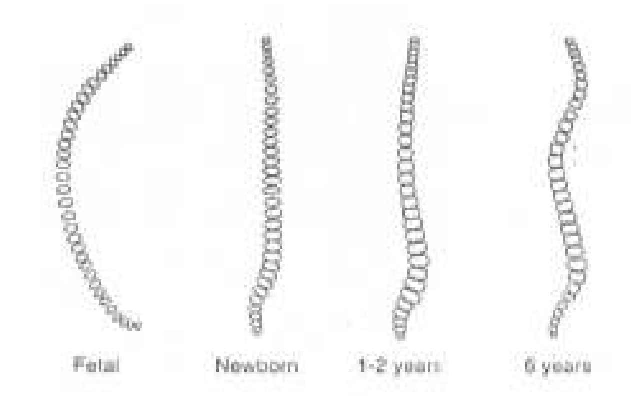
The motor age and the developmental quotient are good summary descriptors of the child and have more meaning than plotting each Milestone.

Because the lower limit is 70, this boy’s DQ falls within The “suspect” or gray zone.

In reality, infants falling into the gray zone of motor domains usually do quite well and rarely require referral to an Early intervention program.

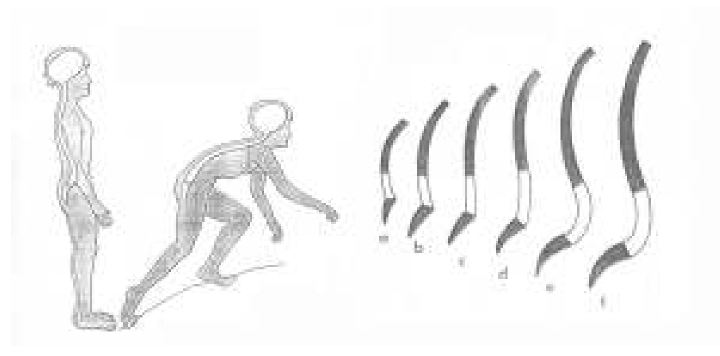
This is in contrast to those falling in the gray zones of the cognitive domains.

Development of the Spinal Curvatures.



- The primary curves are thoracic and sacral kyphosis, and the secondary or compensatory curves in the sagittal plane are cervical and lumbar lordosis **.**
- These curves balance each other so that the head is centered over the pelvis.

On the first day of life, the lumbar column is concave anteriorly.



- At five months the lumber curve is still slightly concave anteriorly and it disappears at the 13 months.
- From 3 years onwards, the lumbar lordosis begins to appear.
- Becoming obvious by 8 years and assuming the definitive adult state at 10 years

Walking Developmental Characteristics

- Base of support
- Foot contact
- Foot angle
- Pelvic rotation
- Arm position
- Step and stride length
- Walking speed

Maturation of Gait

It takes several years for a mature gait pattern Characteristics of a mature gait pattern include:

- A narrow base of support,
- Smooth movements with minimal .Oscillations of the center of gravity
- Reciprocal arm swing.

a mature gait is present in normal children by age 5.

At the age 1 year

- have much higher step frequency (180 steps/minute) than adults.
- They do not have reciprocal arm swing; arms are held in "high guard."
- The hip joint remains externally rotated throughout the gait cycle, and the knee remains flexed.
- The ankle is in plantar flexion at heel strike, and dorsiflexion during swing phase is diminished.
- Hip flexion, pelvic tilt and hip abduction are all
- increased during swing phase.
- Single-limb stance is reduced, and the base of support
- is wide.

At 18 months

- Nearly all children walk with heelstrike.
- and more than 70 percent have reciprocal arm swing.
- The base of support narrows significantly but remains wider than a mature gait pattern.

Two-year-old children

- Have less pelvic tilt,
- Abduction and external rotation of the hip.
- Nearly 80 percent have reciprocal arm swing, and knee flexion during stance is more pronounced than in older walkers.
- Duration of single-limb stance is less than 34 percent,
- and the base of support remains wide although it has narrowed somewhat.

In 3-year-old children

Duration of single-limb stance is about 35 percent.

Ninety percent have reciprocal arm swing.

The base of support is proportionately similar to adults.

Differences from a mature adult gait include a greater knee flexion wave during stance and slightly increased pelvic rotation, hip joint rotation and hip abduction.

However, children have achieved an adult pattern of joint angles throughout the gait cycle by this stage.

The gait of a 7-year-old child

The same differences from an adult's gait as a 3-year-old's does-but to a lesser degree.

- Adult cadence, step length and velocity cannot be achieved until adequate growth occurs.
- Duration of single-limb stance in a 7-year-old is about 38 percent. (In adults, duration is about 39 percent).

Not:

- Every child grows and develops at his or her own pace. Still, child development tends to follow a fairly predictable path.
- These general child development milestones for ages 0 to 5 years.

Normal Stages of Human Development (Birth to 5 Years)

<u>Birth to 1 month</u>:

Feedings: 5-8 per day

Sleep: 20 hrs per day

Sensory Capacities: makes basic distinctions in vision, hearing, smelling, tasting, touch, temperature, and perception of pain.

<u>2 to 3 months</u>

Sensory Capacities: color perception, visual exploration, oral exploration.

Sounds: cries, coos, grunts.

Motor Ability: Control of eye muscles, lifts head when on stomach.

4 to 6 months

Sensory Capacities: localizes sounds

Sounds: babbling, makes most vowels and about half of the consonants

Feedings: 3-5 per day

Motor Ability: control of head and arm movements, purposive grasping, rolls over.

7 to 9 months

Motor Ability: control of trunk and hands, sits without support, craw ls about.

10 to 12 months

Motor Ability: control of legs and feet, stands, creeps, apposition of thumb and fore-finger.

Language: says one or two words, imitates sounds, responds to simple commands.

Feedings: 3 meals, 2 snacks

Sleep: 12 hours, 2 naps

1 to 1 ½ years

Motor Ability: creeps up stairs, walks (10-20 min), makes lines on paper with crayon.

1 ½ to 2 years

Motor Ability: runs, kicks a ball, builds 6 cube tower (2yrs) Capable of bowel and bladder control.

Language: vocabulary of more than 200 words

Sleep: 12 hours at night , 1-2 hr nap.

2 to 3 years

Motor Ability: jumps off a step, rides a tricycle, uses crayons, builds a 9-10 cube tower.

Language: starts to use short sentences controls and explores world with language, stuttering may appear briefly.

3 to 4 years

Motor Ability: Stands on one leg, jumps up and down, draws a circle and a cross (4 yrs) Self-sufficient in many routines of home life.**4**

to 5 years

Motor ability: mature motor control, skips, broad jumps, dresses himself, copies a square and a triangle.

Language: talks clearly, uses adult speech sounds, has mastered basic grammar, relates a story, knows over 2,000 words (5 yrs).

Fine Motor Skill

- Fine motor skills pertain to the manipulation of objects.
- A pincer grasp is what is ultimately needed for good fine motor control.
- These skills are then linked with visuo-spatial skills, which are both motor and cognitive skills.
- *1 month*: hands mostly closed
- *2 months:* grasp reflex
- *3 months:* hands mostly open , infants can coordinate movements of limbs.
- *4 months:* hands come together, overriding the asymmetric tonic neck reflex (ATNR).
- *4-5 months*: Child can start to learn about an object through inspection (visual and oral).
- *At 5 months:* grasps an object voluntarily.
- *6 months:* two hands may come together; transfers Thereafter his grasp has to go through several stages: ulnar grasp, radial grasp, finger thumb (pincer) grasp
- *10 months:* early finger-thumb grasp: can let go of objects (casting)
- 11 momths: Infants can grasp an object by 11 months
- *12 months:* mature pincer grasp
- *13 months:* builds a tower of two 1" cubes
- 15 months: picks up a cup, drinks from it, and puts it down without much spilling.
- 16 months :Infants have the fine motor ability to scribble with a crayon by about 16 to 18 months of age when they have a holding grip (all fingers together like a cup).
- *18 months:* he turns 2 or 3 pages of a book at a time
- *2 years:* turns pages singly; can put on socks. By age 2, infants can drink from a cup without spilling.
- Children must have manual or fine motor (hand) control to hold a pencil or crayon in order for them to write, draw, or color.
- By the end of the second year, infants can make simple vertical and horizontal figures.

- By two years of age, the child shows a preference for one hand; however, hand dominance can occur much later at around four years of age.
- *2.5 years:* threads beads
- *3 years:* fastens buttons, dresses and undresses self.
- By the age of four, children have developed considerable mastery of a variety of grips, so that they can wrap their fingers around the pencil.
- Bimanual control is also involved in fine motor development, which enables a child to use both hands to perform a task, such as holding a paper and cutting with scissors, and catching a large ball.

MOS.	GROSS MOTOR SKILLS	FINE MOTOR SKILLS	RED FLAGS
1	Head up in prone	Hands tightly fisted	
2	Chest up in prone position Head bobs erect if held sitting	Retains rattle (briefly) if placed in hand Hands unfisted half of time	Rolling prior to 3 months may indicate hypertonia
3	Partial head lag Rests on forearms in prone	Hands unfisted most of time Bats at objects Sustained voluntary grasp possible if object placed in ulnar side of hand	
4	Up on hands in prone Rolls front to back No head lag	Obtains/retains rattle Reaches/engages hands in supine Clutches at objects	
5	Rolls back to front Lifts head when pulled to sit Sits with pelvic support Anterior protection	Transfers objects hand-mouth-hand Palmar grasp of dowel, thumb adducted	Poor head control

MOS.	GROSS MOTOR SKILLS	FINE MOTOR SKILLS	RED FLAGS
6	Sits-props on hands	Transfers objects hand-hand Immature rake of pellet	
7	Sits without support Supports weight and bounces while standing Commando crawls Feet to mouth Lateral protection	Radial-palmar grasp of cube Pulls round peg out Inferior scissors grasp of pellet; rakes object into palm	W-sitting and bunny hopping, may indicate adductor spasticity or hypotonia
8	Gets into sitting position Reaches with one hand while 4-point kneeling	Scissors grasp of pellet held between thumb and side of curled index finger Takes second block; holds 1 block in each hand	
9	Pulls to stand Creeps on hands and knees	Radial-digital grasp of cube held with thumb and finger tips Inferior pincer grasp of pellet held between ventral surfaces of thumb and index finger	Persistence of primitive reflexes may indicate neuromotor disorder
10	Cruises around furniture Walks with 2 hands held	Isolates index finger and pokes Clumsy release of cube into box; hand rests on edge Pincer grasp, held between distal pads of thumb and index finger	
11	Stands alone Walks with 1 hand held		
12	Independent steps Posterior protection	Fine pincer grasp of pellet between finger tips Marks with crayon Attempts tower of 2 cubes Precise release of cube Attempts release of pellet into bottle	Failure to develop protective reactions may indicate neuromotor disorder
14	Walks well independently	Tower of 2 cubes Attains third cube	

16	Creeps up stairs Runs stiff-legged Climbs on furniture Walks backwards Stoops and recovers	Precise release of pellet into small container Tower of 3 cubes Imitates scribble		
18	Push/pulls large object Throws ball while standing Seats self in small chair	Tower of 4 cubes Crudely imitates single stroke Scribbles spontaneously		Hand dominance prior to 18 months may indicate contralateral weakness
20	Walks up stairs with hand held	Completes square pegboard		
22	Walks up stairs with rail, marking time Squats in play	Tower of 6 cubes		
24	Jumps in place Kicks ball Walks down stairs with rail, marking time Throws overhand	Train of cubes without stack Imitates vertical stroke		Inability to walk up and down stairs may be the result of lack of opportunity

Perception

Young children use their senses (touch, taste, smell, sight, and hearing) in an attempt to learn about the world.

- They also think with their senses and movement.
- They form perceptions from their sensory activities.
- Sensory-Perceptual development is the information that is collected through the senses, the ideas that are formed about an object or relationship as a result of what the child learns through the senses
- Infancy is a time of rapid growth. Cognitive, physical, and social developmental changes are very evident.
- While there is variation in the rate of growth, most infants follow a similar pattern of **development from month to month**.Much of this growth is under the influence of genetic maturation, however, the child's environment is critical.

- Infants need quality nutrition, health care, interaction, **tenderness and touch**, and novelty in order to maximize their abilities and potential. life

Major Factors Affects in the Acquisition of Motor Skills

- depends primarily on maturation of the brain & central nervous system.
- results from interaction between heredity & the physical and social environment.
- occurs in predictable sequences for all children though the rate will vary.
- earlier phases of growth must be completed satisfactorily if later phases are to proceed normally.
- there are times during growth which are optimal for the acquisition of new behaviours - sensitive periods - child has reach a maturational readiness.
- Postural control is an important component of motor development, without which controlled movements are not possible.
- Awareness. The infant becomes aware of his or her movements, and learns to take pleasure from them. Pleasure is derived from both the movements themselves, and from the effect that the movements can have on the environment.
- Linking. Complex physical skills are created by linking simpler movements. Infants start out by learning basic movements or postures such as sitting, standing, walking.
- Acquisition of other developmental skills. As more complex movements become possible, the infant and child is able to develop other developmental skills such as language, cognition, and social-emotional skills. In turn, the acquisition of these other developmental skills allows for the acquisition of more complex motor skills.